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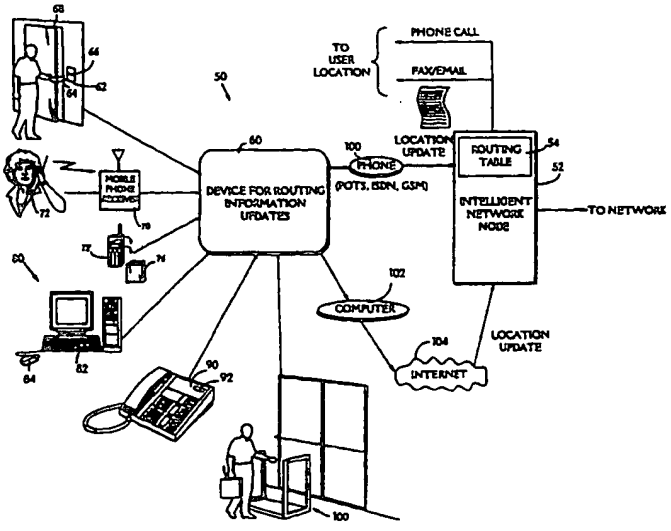

(57) Abstract

A telecommunications network automatically registers and de-registers terminal equipment based on sensed user location. A Universal Personal Telecommunications (UPT) user does not need to remember or take the time to manually register upon arriving at a location or de-register before leaving a location. Instead, automatic sensing devices sense when the UPT user arrives and/or leaves a location. A device for routing information updates automatically generates and sends UPT registration and de-registration messages to an Intelligent Network node in response to sensed user location. The Intelligent Network node updates its routing tables in response to the messages, and automatically routes user calls to the appropriate terminal locations based on the routing tables.

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DEVICE FOR ROUTING INFORMATION UPDATES

Field of the Invention

This invention relates to telecommunications networks such as Intelligent Networks. Still more particularly, this invention relates to Universal Personal Telecommunications, and to systems and methods for automatically updating a telecommunications network concerning the location of a Universal Personal Telecommunications user.

Background and Summary of the Invention

People have more convenient access to telecommunications devices than ever before. Almost everyone has a telephone at home, and most of us also have a telephone at work. Some people also carry portable cellular telephones with them wherever they go. We can see people talking on digital pocket phones in the car, in restaurants, in shopping malls and at the beach.

This multiplicity of communications devices theoretically allows a person to be contacted wherever he or she happens to be. However, the process of successfully reaching a particular person has become complicated. Nowadays, when you ask for someone's telephone number, it is common to get back a list of phone numbers: the work number, the home number, the cellular phone number, the work facsimile number, the home facsimile number, an electronic mail address, etc. All of these telephone numbers are difficult to remember. One must also guess which numbers to try first. It can take a long time to dial the numbers in the list until you finally try the right one. Failed attempts can be expensive if the caller is calling long distance and an answering machine, fax machine or voice mail answers the telephone in the person's absence.

"Universal Personal Telecommunication" ("UPT") addresses this problem. The objective of personal telecommunications is to provide a means of communicating with anyone, anytime, anywhere -- whether at work, at home or on the move. Under the UPT concept, the telecommunications network takes care of routing your call to the correct telephone or other terminal device. You request the

network to connect you to the person you want to reach -- not to a place or a particular terminal. You need not know where this person is for the moment -- the network will find out.

In UPT, the fixed association between terminal access and user identification is removed. The network treats identification of UPT users separately from the addressing of terminals and network access points. Any UPT user can make and receive calls on any terminal. The so-called "Intelligent Network" ("IN") architecture can be used to efficiently implement Universal Personal Telecommunications. See, for example, S derberg, L., "Evolving an Intelligent Architecture for Personal Telecommunication", 4 Ericsson Review 156-170 (1993); Sundborg, J., "Universal Personal Telecommunication (UPT) -- Concept and Standardisation", 4 Ericsson Review 140-155 (1993); and Wallinder, S., "Implementation of UPT--Universal Personal Telecommunications", 1 Ericsson Review (1994).

Because UPT user identification is independent of telephone or other terminal addressing, the telecommunications network must have some way of locating users so it can associate them with nearby telephones or other terminals. UPT requires the network to be constantly updated about UPT users' locations, to enable routing of phone calls and email/fax to the right network address (extension/location). This locating process is sometimes called personal mobility call registration.

In the past, personal mobility registration has been carried out manually, i.e., the user of the service has to access the service from some kind of terminal and manually tell it to associate that (or a different) terminal with the user for the time at least. For example, the UPT user can register a terminal address for incoming calls -- telling the network to route all incoming calls for that user to that terminal address. The UPT user can also register outgoing calls so all outgoing calls from a terminal will be charged to the user. The call registration is made as an update of the UPT user's current terminal address. Such updates are normally done by means of DTMF tone signaling from an ordinary telephone, or via computer terminals connected to the Intelligent Network service management system.

For example, in the standard telephone example, when the UPT user arrives at a new location he can pick up a standard telephone set and dial the UPT service. The user may be required to input his personal universal telephone number and an

associated personal identification number or other password to identify and authenticate himself to the UPT service. The UPT service may prompt the user with a voice menu. The user can make selections by depressing corresponding touch-tone buttons on the standard telephone set. One of the options may be "personal mobility." Upon selecting this option, the user may be prompted concerning what kind of registration he desires (e.g., register incoming calls, register outgoing calls, or registering all calls). Upon depressing an appropriate touch-tone button to select registration type, the service may prompt the user to enter the terminal address of the terminal device he is registering and the time when registration is to expire.

In another prior registration example, the user may use a display device to access the UPT service. The display enables the UPT user to receive graphical information on the screen, and to respond by touching the screen, using a mouse or pressing buttons on a separate keyboard. See Sundborg (cited above), Figure 12.

An appropriate node (or nodes) in the network updates its routing table upon receiving a call registration. From then until the registration is canceled or superseded, the network will route all incoming calls for that UPT user to the registered terminal address -- and may also charge the user for all calls outgoing from that terminal address. The registration may have a certain valid time period associated with it. A new call registration from the same UPT user will cancel the one made previously. The UPT user can explicitly de-register -- breaking the association between the user and a network address.

A significant problem with prior personal mobility features described above is that the user has to remember (and take the time) to update the network routing table each time he or she changes location. If the user forgets or doesn't take the time to manually update the network, the network will be unable to direct messages to the right location and terminal. This can cause serious problems. For example, the network may erroneously direct an important personal call to the user's work phone after the user has gone home for the day.

The prior art includes various techniques for locating subscribers and routing calls to subscriber locations. For example:

U.S. Patent No. 5,506,887 teaches an Advanced Intelligent Network system providing a personal communication service to subscriber wireless handsets or other

portable devices (e.g., laptop computers). When a wireless unit comes within range of a mobile base station, the mobile base station automatically dials and informs the central network controller of the registration.

WO 95/34985 (Alcatel) discloses a subscriber ID card that can be remotely interrogated. Each terminal device which recognizes, through remote interrogation, that the subscriber is nearby reports this fact to the service operator. Calls addressed to the subscriber are directed to the service operator and from there, to whatever terminal device reported last.

WO 95 01070 (Ericsson) discloses sensing when a mobile phone has been placed into a battery charger; and sending a message from the battery charger to the telephone network. This message causes the network to route, to a fixed telephone at the same location, calls directed to the mobile phone. The battery charger similarly detects when the mobile phone has been removed from the charger, and sends a message to the network that causes the network to route, to the mobile phone, calls directed to the fixed telephone.

EP 0520194 (Network Access) discloses a radio tracking system for tracking the location of a telephone user. The user carries a personal communicator that transmits radio signals to the tracking system. The tracking system tracks the user's location, and sends information to the telephone system service node. The service node stores this information in a look-up table along with the directory telephone number of the phone at the subscriber's current location.

EP 0578374 (Northern Telecom) discloses a building access control system using badges. The system determines when subscribers leave and access a building -- and in some cases, where the subscribers are within the building. A telephone switch uses this information to redirect calls to the phone nearest the subscriber.

EP 0 433 465 (NTT) discloses a personal telephone number system. Registration is provided automatically when a portable telephone is connected by a cable to the system. See page 11, lines 11-15.

However, further improvements are possible. For example, none of these references specifically mentions how automatic subscriber locator features including a means that can sense the location of a subscriber without requiring the subscriber to

carry portable telephone equipment, can be integrated with an intelligent network architecture.

The present invention relieves the user of having to manually update the network or the UPT service with the user's location. The present invention solves the manual updating problem by providing methods and devices for automatically generating personal mobility location updates and providing them to the network. By means of a special device connected to either a telephone or to a personal computer/workstation, the telecom service is notified each time the service user is visiting the location where the device is located. The device is capable of detecting when the user is entering/leaving the location where the device is located. Because the UPT service is automatically informed of the user's location, the chance an incoming phone call, facsimile transmission and/or electronic mail message reaching the user is much higher.

When the device detects that the service user is entering the premises, a "location update" is sent to the network node where the routing table is stored. The network node updates the routing table with the terminal address of the nearest terminal (e.g., the phone/fax number and/or email address of the terminal) -- automatically registering the terminal for that user. When the device detects that the service user leaves the premises, it sends another "location update" to the network to de-register the user with respect to that terminal at that location.

Detection of service user presence at a specific location can be accomplished in any of several ways. For example, the network can detect user presence by:

- using information in electronic security locking systems (e.g., where the user must slip a card in a card reader to enter the building);
- detecting "location updates" sent from a mobile phone;
- detecting when a mobile phone is put into its battery charger;
- executing a small application on a personal computer/workstation that lets the user indicate his presence by a single keystroke or mouse "click";
- depressing a special key on a telephone set; and/or

- using an anti-theft system to detect when the user enters/leaves his room or building.

The detection device can be connected to the telecom service in any of several different ways depending upon access method, for example:

- the device send routing updates by means of DTMF signaling (POTS) over a standard telephone link, user-to-user information (ISDN) over an ISDN link, or through use of USSD (GSM) signaling over a GSM link; or

- the device can be connected to a personal computer/workstation, and can send routing updates by means of electronic mail messages over the Internet or other computer network.

Brief Description of the Drawings

These and other features and advantages provided by the invention will be better and more completely understood by referring to the following detailed description of presently preferred embodiments in conjunction with the drawings, of which:

Figure 1 shows a telecommunications system including a device for routing information updates;

Figure 2 is a flowchart of example steps performed by the device for routing information updates; and

Figure 3 is a flowchart of example steps performed by an intelligent network node.

Detailed Description of Presently Preferred Example Embodiments

Figure 1 shows an example overall telecommunications system 50. System 50 may include an Intelligent Network architecture having at least one Intelligent Network node 52. Node 52 may be part of a larger Intelligent Network architecture. Node 52 stores a routing table 54. Routing table 54 may be used as part of the Universal Personal Telephone (UPT) service to route incoming telephone calls, facsimile transmissions and/or electronic mail messages to particular terminals such

as stationary or mobile telephones, fax machines, computers or other terminal devices.

System 50 also includes a device 60 for routing information updates to node 52. In the preferred embodiment, device 60 routes location updates informing node 52 of users' locations. For example, device 60 informs network node 52 when a particular user has arrived at a particular location, and when a particular user has departed from a particular location. Node 52 treats such location updates as UPT call registration or de-registration requests. More specifically, node 52 changes the information in routing table to reflect current user location as indicated by the location updates.

Device 60 includes or is connected to a sensing means for sensing user location. The sensing means can comprise any number of different arrangements or a combination of different arrangements.

In one example, the sensing means can comprise an electronic security locking system 62 or other electronic lock. In this example, the user must slip a card 64 into a card reader 66 to open a door 68 and enter or exit a room or building. When the user slips card 64 into the card reader 66 to enter, the security system 62 senses this and sends a message to the device 60 identifying the card holder. Device 60 sends a corresponding message to node 52 indicating that the identified user is on the premises and can receive telephone calls and other communications there. If the user needs to slip card 64 into the card reader 66 to exit, the security system 62 senses this and sends another message to device 60. Device 60 can send a corresponding message to node 52 indicating that the particular user is no longer on the premises and therefore cannot receive telephone calls or other communications there.

In another example, device 60 can be connected to a conventional mobile telephone receiver 70 of the type that receives mobile telephone location update messages. Such messages are sent periodically by standard mobile telephones 72 whenever they are turned on and operating, to allow cellular communications networks to keep track of which cell the mobile telephones are operating in. Device 60 can respond to such location update messages by automatically generating and sending location update messages to node 52. Node 52 may use such location update messages to register the mobile telephone as the device to which incoming calls for

the phone's owner should be routed, and can route incoming calls to mobile phone 72.

In yet another example, device 60 can be connected to a mobile phone battery charger 76. Battery charging station 76 can alert device 60 whenever mobile phone 72' is placed into the battery charging station. Device 60 can send a location update/registration message to node 52 that de-registers mobile phone 72' as being the user's terminal, and registering the stationary telephone at the charging station 76's location (e.g., the user's home).

In still another example, device 60 can be connected to a conventional personal computer/workstation 80 that runs a small application allowing the user to indicate his presence very simply (e.g., by a single keystroke on keyboard 82 and/or by a "click" of mouse 84). Device 60 can, upon receiving a user presence indicating message from personal computer/workstation 80, send a location update message to node 52 effectively registering the personal computer/workstation (and/or telephones or other telecommunications equipment co-located with the personal computer/workstation) as being the user's destination network address. This registration can expire a certain amount of time after initial registration, or it can stay effective until the user registers from another location.

In yet another example, device 60 can be connected to a conventional telephone set 90 having a special key 92. When the user depresses key 92, device 60 can send a location update message to node 52 registering telephone set 90 as the user's incoming telephone call destination. When the user depresses key 92 again (or depresses a different, "de-registration" key), device 60 can send a further location update message that de-registers telephone set 90 for the user.

In yet another example, device 60 can be connected to a security system 100 of the type shops use to prevent theft. In this example, every user carries a badge, card or other object having a personalized transducer that electronically indicates user identity. Security system 100 detects when the user walks into the room or building, and also detects when the user walks out of the room or building. Security system 100 sends responsive messages to device 60, which in turn sends location update information to node 52 for purposes of registering or deregistering particular terminal

devices at the location with respect to particular users who have walked through the security system 100.

The location update information generated by device 60 may include the following information for example:

user identity information (e.g., user's UPT number or another identification from which the network node 52 can derive the user's UPT number);

registration/deregistration indicator (i.e., whether the user is arriving or leaving the location); and

an optional registration time duration (e.g., in the case of sensing devices that sense only arrival and not departure, the registration can be set for a certain number of hours such as the length of a work day for registering a place of work).

Device 60 can be connected to node 52 through any number of different communications paths. In one example, device 60 is connected through a standard telecommunications link such as DTMF (POTS) signaling, user-to-user information (ISDN) signaling, or USSD (GSM) signaling. In another example, device 60 can be connected to node 52 through a computer 102. Computer 102 can route messages from device 60 to node 52 through electronic mail or other messages over a computer network such as the Internet 104.

Figure 2 shows example steps performed by device 60. In this example, device 60 senses the user's arrival at a certain location (Figure 2, decision block 150). If the user has not yet arrived, device 60 keeps on checking periodically. Device 60 senses when the user arrives and is on site ("yes" exit to decision block 150), and sends a location update message to node 52 that registers the telecommunications devices at the location (Figure 2, block 152). Device 60 may then, if desired, sense user departure from the location (Figure 2, decision block 154). If the user has not yet departed, device 60 waits and keeps on checking. Device 60 senses when the user departs from the location (Figure 2, "yes" exit to decision block 154), and sends a corresponding location update to node 52 that de-registers the telecommunications devices at the location.

Figure 3 shows an example process performed by node 52. In this example, node 52 determines whether it has received a location update from device 60 (Figure 3, decision block 200). If it has ("yes" exit to decision block 200), node 52 retrieves

the network addresses of the telecommunications devices of the corresponding location from a database (block 202), and writes those network addresses into routing table 54 (Figure 3, block 204). If node receives an incoming call for the user ("yes" exit to decision block 206), node 52 routes the call to the user location based on the routing information contained within routing table (Figure 3, block 208).

The present invention thus allows a telecommunications network to automatically register and de-register terminal equipment based on sensed user location. The UPT user does not need to remember to manually register upon arriving at a location or de-register upon leaving a location. Instead, automatic sensing devices sense when the UPT user arrive and/or leave a location, and a device for routing information updates automatically generates and sends UPT registration and/or de-registration messages to an intelligent network node in response to sensed user location.

While the invention has been described in connection with various preferred embodiments, the embodiments have been presented by way of example only, and not limitation. The breadth and scope of the present invention should not be limited by any of the described example embodiments, but to the contrary, should be defined only in accordance with the following claims and their equivalents.

What is claimed is:

1. A telecommunications system having an intelligent network architecture, the system comprising:

an intelligent network including at least one intelligent network node, the intelligent network node storing at least one intelligent network universal personal telephone service routing table and routing calls to users at least in part in response to the routing table contents;

at least one means for sensing user location without requiring the user to carry portable telephone equipment; and

a device for routing information updates coupled to the sensing means and to the intelligent network node, the device for routing information updates generating intelligent network universal personal telephone service location update messages in response to the sensing means and sending the intelligent network universal personal telephone service location update messages to the intelligent network node, the intelligent network node updating its intelligent network universal personal telephone service routing table at least in part in response to the location update messages.

2. A telecommunications system as in claim 1 wherein the sensing means comprises a personal computer including a keyboard and a mouse, the personal computer running a small application that allows the user to indicate his presence by a single keystroke on the keyboard and/or clicking the mouse.

3. A telecommunications system as in claim 1 wherein the location update message includes a user UPT number, a registration/deregistration indicator, and an optional registration time duration.

4. A telecommunications system comprising:

an intelligent network including at least one intelligent network node, the intelligent network node storing at least one routing table and routing calls to users at least in part in response to the routing table contents;

at least one means for sensing user location; and

a device for routing information updates coupled to the sensing means and to the intelligent network node, the device for routing information updates generating location update messages in response to the sensing means and sending the location

update messages to the intelligent network node, the intelligent network node updating its routing table at least in part in response to the location update messages.

5. A telecommunications system as in claim 4 wherein the sensing means comprises an electronic lock.

6. A telecommunications system as in claim 4 wherein the sensing means comprises a mobile phone receiver responsive to location updates generated by a mobile phone.

7. A telecommunications system as in claim 4 wherein the sensing means comprises a mobile phone battery charging station that senses when a mobile phone is coupled thereto.

8. A telecommunications system as in claim 4 wherein the sensing means comprises a computer that senses user manipulation thereof.

9. A telecommunications system as in claim 4 wherein the sensing means comprises a telephone set including a special key, the special key, in use, being depressed by the user to indicate user presence at the location of the telephone set.

10. A telecommunications system as in claim 4 wherein the sensing means comprises a security system that automatically senses user passage through a security zone.

11. A telecommunications system as in claim 4 further including means for coupling the routing device to the intelligent network node.

12. A telecommunications system as in claim 11 wherein the coupling means comprises a standard DTMF telephone signaling line.

13. A telecommunications system as in claim 11 wherein the coupling means comprises an ISDN signaling link.

14. A telecommunications system as in claim 11 wherein the coupling means comprises a GSM signaling link.

15. A telecommunications system as in claim 11 wherein the coupling means comprises means for sending a message over the Internet.

16. A method of registering a terminal to a user comprising:

(a) automatically sensing user presence at a location having at least one terminal;

(b) generating a location update message in response to step (a); and

(c) in response to the location update message generated by step (b), registering the terminal to the user sensed by step (a).

17. A method as in claim 16 wherein sensing step (a) comprises sensing user operation of an electronic lock.

18. A method as in claim 16 wherein sensing step (a) comprises sensing receipt of at least one mobile phone location update message.

19. A method as in claim 16 wherein sensing step (a) comprises sensing coupling of a mobile phone to a battery charger.

20. A method as in claim 16 wherein sensing step (a) comprises sensing user operation of a computer device.

21. A method as in claim 16 wherein sensing step (a) comprises sensing user depression of a special button mounted on a telephone set.

22. A method as in claim 16 wherein sensing step (a) comprises sensing user passage through a security system.

23. A method as in claim 16 further including transmitting the location update message to an intelligent network node over the Internet.

24. A method as in claim 16 further including transmitting the location update message to an intelligent network node over a conventional telecommunications link.

25. In a telecommunications network of the type including a Universal Personal Telecommunications service that enables the network to route incoming communications directed to a particular user to any of a multiplicity of terminal devices, a method of automatically de-registering a terminal device comprising:

(a) automatically sensing user departure from the terminal device location;

(b) generating a location update message in response to step (a); and

(c) in response to the location update message generated by step (b), deregistering the terminal with respect to the user sensed by step (a).

26. A method as in claim 25 wherein the sensing step senses the identity of the user, and the generating step generates a location update message that encodes sensed user identity.

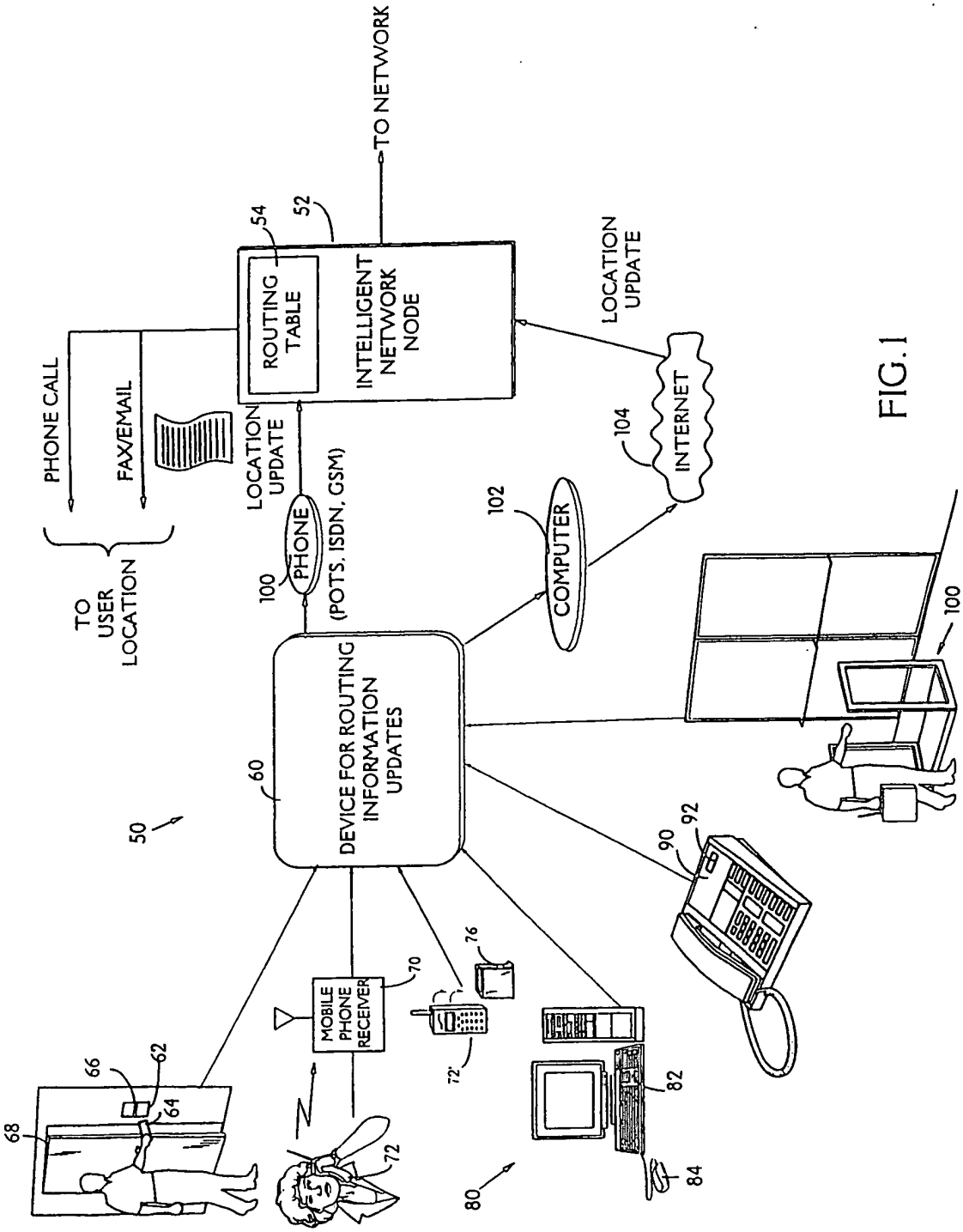
TO NETWORK
INTELLIGENT NETWORK NODE
ROUTING TABLE
LOCATION UPDATE
PHONE CALL
FAX/EMAIL
TO USER LOCATION
LOCATION UPDATE
PHONE
(POTS, ISDN, GSM)
COMPUTER
INTERNET
DEVICE FOR ROUTING INFORMATION UPDATES
MOBILE PHONE RECEIVER
50
52
54
60
62
64
66
68
70
72
72'
76
80
82
84
90
92
100
102
104

FIG.1

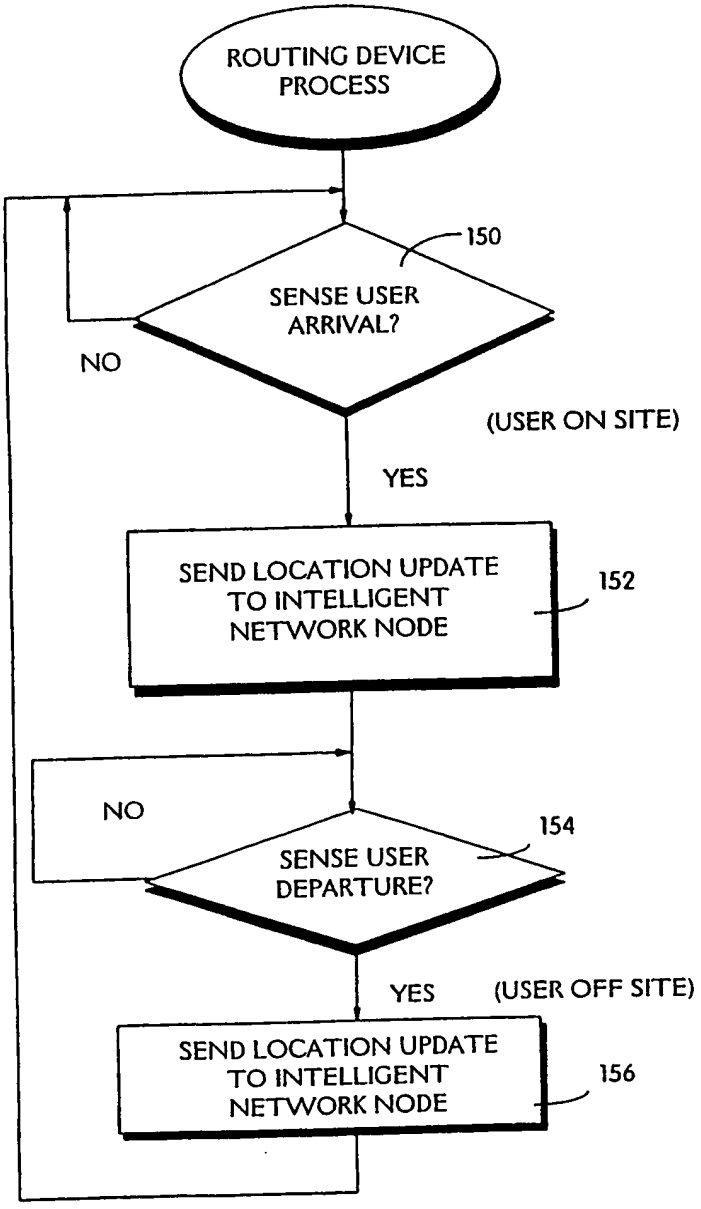
ROUTING DEVICE PROCESS
150
SENSE USER ARRIVAL?
NO
(USER ON SITE)
YES
SEND LOCATION UPDATE TO INTELLIGENT NETWORK NODE
152
NO
154
SENSE USER DEPARTURE?
YES
(USER OFF SITE)
SEND LOCATION UPDATE TO INTELLIGENT NETWORK NODE
156

FIG.2

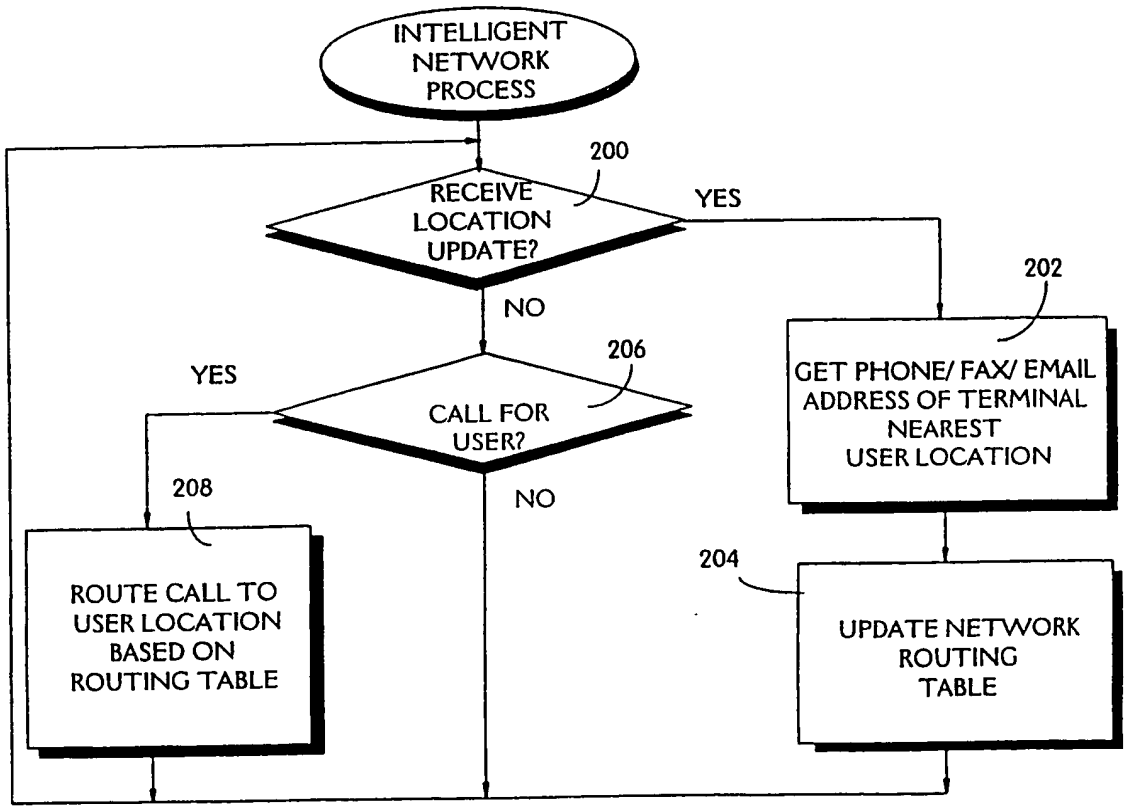
INTELLIGENT NETWORK PROCESS
200
RECEIVE LOCATION UPDATE?
YES
NO
202
GET PHONE/ FAX/ EMAIL ADDRESS OF TERMINAL NEAREST USER LOCATION
206
CALL FOR USER?
YES
NO
208
ROUTE CALL TO USER LOCATION BASED ON ROUTING TABLE
204
UPDATE NETWORK ROUTING TABLE

FIG.3

INTERNATIONAL SEARCH REPORT

Inter .onal Application No
PCT/SE 97/01896

A. CLASSIFICATION OF SUBJECT MATTER
IPC 6 H04Q7/38 H04M3/42

According to International Patent Classification(IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
IPC 6 H04Q H04M

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category °	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	DE 44 20 462 A (SEL ALCATEL AG) 14 December 1995 see the whole document ---	1-6, 8-18, 20-24
X	EP 0 448 076 A (FUJITSU LIMITED) 25 September 1991 see column 10, line 54 - column 11, line 39 see column 6, line 23 - column 9, line 5 ---	1-4, 8-13,16, 20-22, 24,25
X	EP 0 484 067 A (AMERICAN TELEPHONE & TELEGRAPH) 6 May 1992 see the whole document --- -/--	1,4,5,8, 11,16, 17,20, 25,26

[X] Further documents are listed in the continuation of box C.

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16 April 1998	23/04/1998

Name and mailing address of the ISA	Authorized officer
European Patent Office, P.B. 5818 Patentlaan 2 NL - 2280 HV Rijswijk Tel. (+31-70) 340-2040, Tx. 31 651 epo nl, Fax: (+31-70) 340-3016	Janyszek, J-M

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